

# PATENT COOPERATION TREATY

From the  
INTERNATIONAL PRELIMINARY EXAMINING AUTHORITY

To: ROBERT D. FISH  
CROCKETT & FISH  
1440 N. HARBOR BLVD.  
FULLERTON, CA 92835

## PCT

### NOTIFICATION OF TRANSMITTAL OF INTERNATIONAL PRELIMINARY EXAMINATION REPORT

(PCT Rule 71.1)

Date of Mailing  
(day/month/year)

07 MAR 2001

Applicant's or agent's file reference

213/219-PCT2

#### IMPORTANT NOTIFICATION

International application No.

PCT/US99/24920

International filing date (day/month/year)

21 OCTOBER 1999

Priority Date (day/month/year)

23 OCTOBER 1998

Applicant

FLUOR CORPORATION

1. The applicant is hereby notified that this International Preliminary Examining Authority transmits herewith the international preliminary examination report and its annexes, if any, established on the international application.
2. A copy of the report and its annexes, if any, is being transmitted to the International Bureau for communication to all the elected Offices.
3. Where required by any of the elected Offices, the International Bureau will prepare an English translation of the report (but not of any annexes) and will transmit such translation to those Offices.

#### 4. REMINDER

The applicant must enter the national phase before each elected Office by performing certain acts (filing translations and paying national fees) within 30 months from the priority date (or later in some Offices)(Article 39(1))(see also the reminder sent by the International Bureau with Form PCT/IB/301).

Where a translation of the international application must be furnished to an elected Office, that translation must contain a translation of any annexes to the international preliminary examination report. It is the applicant's responsibility to prepare and furnish such translation directly to each elected Office concerned.

For further details on the applicable time limits and requirements of the elected Offices, see Volume II of the PCT Applicant's Guide.

Name and mailing address of the IPEA/US  
Commissioner of Patents and Trademarks  
Box PCT  
Washington, D.C. 20231

Facsimile No. (703) 305-3230

Authorized officer

ALEXA DOROSHENK

DEBORAH THOMAS  
PARALEGAL SPECIALIST

Telephone No. (703) 308-1868

# TENT COOPERATION TREA

## PCT

### INTERNATIONAL PRELIMINARY EXAMINATION REPORT

(PCT Article 36 and Rule 70)

Applicant's or agent's file reference 213/219-PCT2	FOR FURTHER ACTION See Notification of Transmittal of International Preliminary Examination Report (Form PCT/IPEA/416)	
International application No. PCT/US99/24920	International filing date (day/month/year) 21 OCTOBER 1999	Priority date (day/month/year) 23 OCTOBER 1998
International Patent Classification (IPC) or national classification and IPC IPC(7): B01J 8/02, 8/08; B01F 23/90 and US Cl.: 422/211, 215, 220, 224, 231		
Applicant FLUOR CORPORATION		

1. This international preliminary examination report has been prepared by this International Preliminary Examining Authority and is transmitted to the applicant according to Article 36.

2. This REPORT consists of a total of 2 sheets.

☒ This report is also accompanied by ANNEXES, i.e., sheets of the description, claims and/or drawings which have been amended and are the basis for this report and/or sheets containing rectifications made before this Authority. (see Rule 70.16 and Section 607 of the Administrative Instructions under the PCT).

These annexes consist of a total of 2 sheets.

3. This report contains indications relating to the following items:

- I ☒ Basis of the report
- II ☐ Priority
- III ☐ Non-establishment of report with regard to novelty, inventive step or industrial applicability
- IV ☒ Lack of unity of invention
- V ☒ Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement
- VI ☐ Certain documents cited
- VII ☐ Certain defects in the international application
- VIII ☐ Certain observations on the international application

Date of submission of the demand  19 MAY 2000	Date of completion of this report  08 FEBRUARY 2001
Name and mailing address of the IPEA/US Commissioner of Patents and Trademarks Box PCT Washington, D.C. 20231	Authorized officer  ALEXA DOROSHENK DEBORAH THOMAS Telephone No. (703) 308-1868 PARALEGAL SPECIALIST
Facsimile No. (703) 305-3230	

## INTERNATIONAL PRELIMINARY EXAMINATION REPORT

International application No.

PCT/US99/24920

**I. Basis of the report****1. With regard to the elements of the international application:\***☐ the international application as originally filed☒ the description:

pages (See Attached) \_\_\_\_\_, as originally filed  
pages \_\_\_\_\_, filed with the demand  
pages \_\_\_\_\_, filed with the letter of \_\_\_\_\_

☒ the claims:

pages (See Attached) \_\_\_\_\_, as originally filed  
pages \_\_\_\_\_, as amended (together with any statement) under Article 19  
pages \_\_\_\_\_, filed with the demand  
pages \_\_\_\_\_, filed with the letter of \_\_\_\_\_

☒ the drawings:

pages (See Attached) \_\_\_\_\_, as originally filed  
pages \_\_\_\_\_, filed with the demand  
pages \_\_\_\_\_, filed with the letter of \_\_\_\_\_

☒ the sequence listing part of the description:

pages (See Attached) \_\_\_\_\_, as originally filed  
pages \_\_\_\_\_, filed with the demand  
pages \_\_\_\_\_, filed with the letter of \_\_\_\_\_

**2. With regard to the language, all the elements marked above were available or furnished to this Authority in the language in which the international application was filed, unless otherwise indicated under this item.**

These elements were available or furnished to this Authority in the following language \_\_\_\_\_ which is:

☐ the language of a translation furnished for the purposes of international search (under Rule 23.1(b)).☐ the language of publication of the international application (under Rule 48.3(b)).☐ the language of the translation furnished for the purposes of international preliminary examination (under Rules 55.2 and/or 55.3).**3. With regard to any nucleotide and/or amino acid sequence disclosed in the international application, the international preliminary examination was carried out on the basis of the sequence listing:**☐ contained in the international application in printed form.☐ filed together with the international application in computer readable form.☐ furnished subsequently to this Authority in written form.☐ furnished subsequently to this Authority in computer readable form.☐ The statement that the subsequently furnished written sequence listing does not go beyond the disclosure in the international application as filed has been furnished.☐ The statement that the information recorded in computer readable form is identical to the written sequence listing has been furnished.**4. ☒ The amendments have resulted in the cancellation of:**☒ the description, pages NONE☒ the claims, Nos. NONE☒ the drawings, sheets/fig. NONE**5. ☐ This report has been drawn as if (some of) the amendments had not been made, since they have been considered to go beyond the disclosure as filed, as indicated in the Supplemental Box (Rule 70.2(c)).\*\***

\* Replacement sheets which have been furnished to the receiving Office in response to an invitation under Article 14 are referred to in this report as "originally filed" and are not annexed to this report since they do not contain amendments (Rules 70.16 and 70.17).

\*\*Any replacement sheet containing such amendments must be referred to under item 1 and annexed to this report.

# INTERNATIONAL PRELIMINARY EXAMINATION REPORT

International application No.

PCT/US99/24920

## IV. Lack of unity of invention

1. In response to the invitation to restrict or pay additional fees the applicant has:

- ☐ restricted the claims.
- ☐ paid additional fees.
- ☒ paid additional fees under protest.
- ☐ neither restricted nor paid additional fees.

2. ☐ This Authority found that the requirement of unity of invention is not complied with and chose, according to Rule 68, not to invite the applicant to restrict or pay additional fees.

3. This Authority considers that the requirement of unity of invention in accordance with Rules 13.1, 13.2 and 13.3 is

- ☐ complied with.
- ☒ not complied with for the following reasons:

As applicant was previously notified this International Preliminary Examining Authority has found plural inventions claimed in the International Application covered by the claims indicated below:

Group I, claim(s) 1-21, drawn to a bubble cap and a mixing apparatus with bubble cap.

Group II, claim(s) 22-30, drawn to a mixing apparatus with beam support but without bubble cap.

and it considers that the International Application does not comply with the requirements of unity of invention (Rules 13.1, 13.2 and 13.3) for the reasons indicated below:

The inventions listed as Groups I and II do not relate to a single inventive concept under PCT Rule 13.1 because, under PCT Rule 13.2, they lack the same or corresponding special technical features for the following reasons: the special technical feature of the Group I invention is a bubble cap with riser vanes while the special technical feature of the Group II invention is outwardly extending support beams. Because the special technical feature of the Group I invention is not present in the Group II claims and because the special technical feature of the Group II invention is not present in the Group I claims, unity of invention is lacking.

4. Consequently, the following parts of the international application were the subject of international preliminary examination in establishing this report:

- ☒ all parts.
- ☐ the parts relating to claims Nos. ..

## INTERNATIONAL PRELIMINARY EXAMINATION REPORT

International application No.

PCT/US99/24920

**V. Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement****1. statement**

Novelty (N)	Claims <u>1-30</u>	YES
	Claims <u>NONE</u>	NO
Inventive Step (IS)	Claims <u>1-30</u>	YES
	Claims <u>NONE</u>	NO
Industrial Applicability (IA)	Claims <u>1-30</u>	YES
	Claims <u>NONE</u>	NO

**2. citations and explanations (Rule 70.7)**

Claims 1-21 and 28 meet the criteria set out in PCT Article 33(2)-(4), because the prior art does not teach or fairly suggest a distribution tray fitted with a plurality of bubble caps having riser vanes spaced apart from each other to define a plurality of vane passageways wherein the riser vanes are defined by the specification as vanes located above the bubble cap riser and below the cap of the bubble cap.

Claims 22-27 and 29-30 meet the criteria set out in PCT Article 33(2)-(4), because the prior art does not teach or fairly suggest a mixing apparatus comprising a collecting stage that combines a gas phase fluid and a liquid phase fluid to form a mixed phase fluid; a swirl chamber with an outlet downstream of the collecting stage; a distribution tray in fluid communication with and downstream of the outlet; and a plurality of outwardly extending beams that support the mixing apparatus.

Claims 1-30 have industrial applicability because the mixing apparatuses and bubble caps can be used in catalytic industries.

## ----- NEW CITATIONS -----

US 5,635,145 A (DEN HARTOG ET AL) 03 JUNE 1997, see column 3, lines 37-48.

US 5,567,396 A (PERRY ET AL) 22 OCTOBER 1996, see figure 1.

US 5,252,198 A (HARRISON ET AL) 12 OCTOBER 1993, see column 14, lines 48-59.

US 3,589,689 A (ENGLISH) 29 JUNE 1971, see column 7, lines 56-65.

US 3,723,072 A (CARSON ET AL) 03 MARCH 1973, see column 8, lines 5-17.

**Supplemental Box**

(To be used when the space in any of the preceding boxes is not sufficient)

Continuation of: Boxes I - VIII

Sheet 10

**I. BASIS OF REPORT:**

This report has been drawn on the basis of the description,  
page(s) 1-37, as originally filed.  
page(s) NONE, filed with the demand.  
and additional amendments:  
NONE

This report has been drawn on the basis of the claims,  
page(s) 38, as originally filed.  
page(s) NONE, as amended under Article 19.  
page(s) NONE, filed with the demand.  
and additional amendments:  
Pages 39-40, filed with the letter of 30 January 2001.

This report has been drawn on the basis of the drawings,  
page(s) 1-17, as originally filed.  
page(s) NONE, filed with the demand.  
and additional amendments:  
NONE

This report has been drawn on the basis of the sequence listing part of the description:  
page(s) NONE, as originally filed.  
pages(s) NONE, filed with the demand.  
and additional amendments:  
NONE

## INTERNATIONAL SEARCH REPORT

International application No.  
PCT/US99/24920

## A. CLASSIFICATION OF SUBJECT MATTER

IPC(6) : B01J 8/02, 8/08; B01F 23/90

US CL : 422/211, 215, 220, 224, 231

According to International Patent Classification (IPC) or to both national classification and IPC

## B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

U.S. : 422/211, 215, 220, 224, 231

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched  
NONE

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

EAST

key words: mixing, interzone, bubble caps, tray

## C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	US 3,218,249 A (BALLARD ET AL) 16 November 1965, fig. 1 and 5-7 and col. 3, line 69- col. 4, line 23.	1-14
Y	US 4,140,625 A (JENSEN) 20 February 1979, col. 7, line 16 - col. 8, line 5.	1-20
Y	US 5,702,647 A (LEE ET AL) 30 December 1997, fig. 1 and col. 6, lines 51-65.	1-20
E, X	US 5,989,502 A (NELSON ET AL) 23 November 1999, see entire document.	1-20
Y	US 5,152,967 A (ROSSETTI ET AL) 06 October 1992, col. 3, lines 27-54.	1

☐ Further documents are listed in the continuation of Box C. ☐ See patent family annex.

* Special categories of cited documents	*T* later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention
*A* document defining the general state of the art which is not considered to be of particular relevance	*X* document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone
*E* earlier document published on or after the international filing date	*Y* document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art
*L* document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)	*G* document member of the same patent family
*O* document referring to an oral disclosure, use, exhibition or other means	
*P* document published prior to the international filing date but later than the priority date claimed	

Date of the actual completion of the international search

29 DECEMBER 1999

Date of mailing of the international search report

10 FEB 2000

Name and mailing address of the ISA/US  
Commissioner of Patents and Trademarks  
Box PCT  
Washington, D.C. 20231

Facsimile No. (703) 305-3230

Authorized officer

ALEXA DOROSHENK

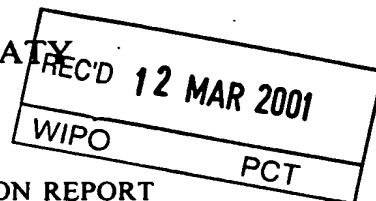
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## PATENT COOPERATION TREATY

## PCT

## INTERNATIONAL PRELIMINARY EXAMINATION REPORT

(PCT Article 36 and Rule 70)



Applicant's or agent's file reference 213/219-PCT2	<b>FOR FURTHER ACTION</b> See Notification of Transmittal of International Preliminary Examination Report (Form PCT/IPEA/416)	
International application No. PCT/US99/24920	International filing date (day/month/year) 21 OCTOBER 1999	Priority date (day/month/year) 23 OCTOBER 1998
International Patent Classification (IPC) or national classification and IPC IPC(7): B01J 8/02, 8/08; B01F 23/90 and US Cl.: 422/211, 215, 220, 224, 231		
Applicant FLUOR CORPORATION		

1. This international preliminary examination report has been prepared by this International Preliminary Examining Authority and is transmitted to the applicant according to Article 36.
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- ☒ This report is also accompanied by ANNEXES, i.e., sheets of the description, claims and/or drawings which have been amended and are the basis for this report and/or sheets containing rectifications made before this Authority. (see Rule 70.16 and Section 607 of the Administrative Instructions under the PCT).

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- I ☒ Basis of the report
- II ☐ Priority
- III ☐ Non-establishment of report with regard to novelty, inventive step or industrial applicability
- IV ☒ Lack of unity of invention
- V ☒ Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement
- VI ☐ Certain documents cited
- VII ☐ Certain defects in the international application
- VIII ☐ Certain observations on the international application

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Date of submission of the demand 19 MAY 2000	Date of completion of this report 08 FEBRUARY 2001
Name and mailing address of the IPEA/US Commissioner of Patents and Trademarks Box PCT Washington, D.C. 20231 Facsimile No. (703) 305-3230	Authorized officer ALEXA DOROSHENK DEBORAH THOMAS Telephone No. (703) 308-1868 PARALEGAL SPECIALIST



## INTERNATIONAL PRELIMINARY EXAMINATION REPORT

International application No.

PCT/US99/24920

**I. Basis of the report****1. With regard to the elements of the international application:\***

- ☐ the international application as originally filed
- ☒ the description:  
pages \_\_\_\_\_ (See Attached) \_\_\_\_\_, as originally filed  
pages \_\_\_\_\_, filed with the demand  
pages \_\_\_\_\_, filed with the letter of \_\_\_\_\_
- ☒ the claims:  
pages \_\_\_\_\_ (See Attached) \_\_\_\_\_, as originally filed  
pages \_\_\_\_\_, as amended (together with any statement) under Article 19  
pages \_\_\_\_\_, filed with the demand  
pages \_\_\_\_\_, filed with the letter of \_\_\_\_\_
- ☒ the drawings:  
pages \_\_\_\_\_ (See Attached) \_\_\_\_\_, as originally filed  
pages \_\_\_\_\_, filed with the demand  
pages \_\_\_\_\_, filed with the letter of \_\_\_\_\_
- ☒ the sequence listing part of the description:  
pages \_\_\_\_\_ (See Attached) \_\_\_\_\_, as originally filed  
pages \_\_\_\_\_, filed with the demand  
pages \_\_\_\_\_, filed with the letter of \_\_\_\_\_

**2. With regard to the language, all the elements marked above were available or furnished to this Authority in the language in which the international application was filed, unless otherwise indicated under this item.**

These elements were available or furnished to this Authority in the following language \_\_\_\_\_ which is:

- ☐ the language of a translation furnished for the purposes of international search (under Rule 23.1(b)).
- ☐ the language of publication of the international application (under Rule 48.3(b)).
- ☐ the language of the translation furnished for the purposes of international preliminary examination (under Rules 55.2 and/or 55.3).

**3. With regard to any nucleotide and/or amino acid sequence disclosed in the international application, the international preliminary examination was carried out on the basis of the sequence listing:**

- ☐ contained in the international application in printed form.
- ☐ filed together with the international application in computer readable form.
- ☐ furnished subsequently to this Authority in written form.
- ☐ furnished subsequently to this Authority in computer readable form.
- ☐ The statement that the subsequently furnished written sequence listing does not go beyond the disclosure in the international application as filed has been furnished.
- ☐ The statement that the information recorded in computer readable form is identical to the written sequence listing has been furnished.

**4. ☒ The amendments have resulted in the cancellation of:**

- ☒ the description, pages \_\_\_\_\_ NONE \_\_\_\_\_
- ☒ the claims, Nos. \_\_\_\_\_ NONE \_\_\_\_\_
- ☒ the drawings, sheets/fig \_\_\_\_\_ NONE \_\_\_\_\_

**5. ☐ This report has been drawn as if (some of) the amendments had not been made, since they have been considered to go beyond the disclosure as filed, as indicated in the Supplemental Box (Rule 70.2(c)).\*\***

\* Replacement sheets which have been furnished to the receiving Office in response to an invitation under Article 14 are referred to in this report as "originally filed" and are not annexed to this report since they do not contain amendments (Rules 70.16 and 70.17).

\*\*Any replacement sheet containing such amendments must be referred to under item 1 and annexed to this report.

## INTERNATIONAL PRELIMINARY EXAMINATION REPORT

International application No.

PCT/US99/24920

**IV. Lack of unity of invention**

1. In response to the invitation to restrict or pay additional fees the applicant has:

- ☐ restricted the claims.  
☐ paid additional fees.  
☒ paid additional fees under protest.  
☐ neither restricted nor paid additional fees.

2. ☐ This Authority found that the requirement of unity of invention is not complied with and chose, according to Rule 68., not to invite the applicant to restrict or pay additional fees.

3. This Authority considers that the requirement of unity of invention in accordance with Rules 13.1, 13.2 and 13.3 is

- ☐ complied with.  
☒ not complied with for the following reasons:

As applicant was previously notified this International Preliminary Examining Authority has found plural inventions claimed in the International Application covered by the claims indicated below:

Group I, claim(s) 1-21, drawn to a bubble cap and a mixing apparatus with bubble cap.

Group II, claim(s) 22-30, drawn to a mixing apparatus with beam support but without bubble cap.

and it considers that the International Application does not comply with the requirements of unity of invention (Rules 13.1, 13.2 and 13.3) for the reasons indicated below:

The inventions listed as Groups I and II do not relate to a single inventive concept under PCT Rule 13.1 because, under PCT Rule 13.2, they lack the same or corresponding special technical features for the following reasons: the special technical feature of the Group I invention is a bubble cap with riser vanes while the special technical feature of the Group II invention is outwardly extending support beams. Because the special technical feature of the Group I invention is not present in the Group II claims and because the special technical feature of the Group II invention is not present in the Group I claims, unity of invention is lacking.

4. Consequently, the following parts of the international application were the subject of international preliminary examination in establishing this report:

- ☒ all parts.  
☐ the parts relating to claims Nos. .

## INTERNATIONAL PRELIMINARY EXAMINATION REPORT

International application No.

PCT/US99/24920

**V. Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement****1. statement**

Novelty (N)	Claims <u>1-30</u>	YES
	Claims <u>NONE</u>	NO
Inventive Step (IS)	Claims <u>1-30</u>	YES
	Claims <u>NONE</u>	NO
Industrial Applicability (IA)	Claims <u>1-30</u>	YES
	Claims <u>NONE</u>	NO

**2. citations and explanations (Rule 70.7)**

Claims 1-21 and 28 meet the criteria set out in PCT Article 33(2)-(4), because the prior art does not teach or fairly suggest a distribution tray fitted with a plurality of bubble caps having riser vanes spaced apart from each other to define a plurality of vane passageways wherein the riser vanes are defined by the specification as vanes located above the bubble cap riser and below the cap of the bubble cap.

Claims 22-27 and 29-30 meet the criteria set out in PCT Article 33(2)-(4), because the prior art does not teach or fairly suggest a mixing apparatus comprising a collecting stage that combines a gas phase fluid and a liquid phase fluid to form a mixed phase fluid; a swirl chamber with an outlet downstream of the collecting stage; a distribution tray in fluid communication with and downstream of the outlet; and a plurality of outwardly extending beams that support the mixing apparatus.

Claims 1-30 have industrial applicability because the mixing apparatuses and bubble caps can be used in catalytic industries.

## ----- NEW CITATIONS -----

US 5,635,145 A (DEN HARTOG ET AL) 03 JUNE 1997, see column 3, lines 37-48.

US 5,567,396 A (PERRY ET AL) 22 OCTOBER 1996, see figure 1.

US 5,252,198 A (HARRISON ET AL) 12 OCTOBER 1993, see column 14, lines 48-59.

US 3,589,689 A (ENGLISH) 29 JUNE 1971, see column 7, lines 56-65.

US 3,723,072 A (CARSON ET AL) 03 MARCH 1973, see column 8, lines 5-17.

INTERNATIONAL PRELIMINARY EXAMINATION REPORT

International application No.

PCT/US99/24920

**Supplemental Box**

(To be used when the space in any of the preceding boxes is not sufficient)

Continuation of: Boxes I - VIII

Sheet 10

**I. BASIS OF REPORT:**

This report has been drawn on the basis of the description,  
page(s) 1-37, as originally filed.

page(s) NONE, filed with the demand.

and additional amendments:

NONE

This report has been drawn on the basis of the claims,  
page(s) 38, as originally filed.

page(s) NONE, as amended under Article 19.

page(s) NONE, filed with the demand.

and additional amendments:

Pages 39-40, filed with the letter of 30 January 2001.

This report has been drawn on the basis of the drawings,  
page(s) 1-17, as originally filed.

page(s) NONE, filed with the demand.

and additional amendments:

NONE

This report has been drawn on the basis of the sequence listing part of the description:

page(s) NONE, as originally filed.

page(s) NONE, filed with the demand.

and additional amendments:

NONE

PCT/US 99/24920  
2009  
1PEA/US 30 JAN 2001

Attorney Docket: 213/219-PCT2

12. The mixing apparatus of claim 11 in which the wall is fitted with a plurality of wall baffles, and further comprising a collection tray having a plurality of floor baffles fluidly communicating with, and upstream of the plurality of openings.
13. The mixing apparatus of claim 1 wherein the fluid guides are also radial support beams that support the swirl chamber.
14. The mixing apparatus of claim 1 further comprising a splash plate fluidly interposed between the outlet of the swirl chamber and the distribution network.
15. A multizoned vessel having a mixing apparatus according to claim 1 fluidly interposed between a first reaction zone and a second reaction zone.
16. A bubble cap comprising a riser, a cap, and a plurality of riser vanes.
17. The bubble cap of claim 16 wherein the riser is disposed upstream of the plurality of riser vanes, and the cap is disposed downstream of the plurality of riser vanes, relative to a fluid flowing through the bubble cap.
18. The bubble cap of claim 16 wherein the plurality of riser vanes are spaced from each other to define a plurality of vane passageways.
19. The bubble cap of claim 16 wherein the riser vanes are flat, curved, or cut at an angle.
20. A mixing apparatus comprising a distribution zone that includes the bubble cap according to claim 16.
21. A mixing apparatus comprising a distribution zone that includes the bubble cap according to claim 18.
22. A mixing apparatus comprising:
  - a collecting stage that combines a substantial gas phase fluid and a substantial liquid phase fluid to form a mixed phase fluid;
  - a swirl chamber downstream of the collecting stage that swirls the mixed phase fluid wherein the swirl chamber has an outlet;
  - a distribution tray in fluid communication with, and downstream of the outlet; and
  - a plurality of outwardly extending beams that physically supports the mixing apparatus.
23. The mixing apparatus of claim 22 wherein the outwardly extending beams support the distribution tray.
24. The mixing apparatus of claim 22 wherein the outwardly extending beams support the swirl chamber.

PCT/US99/24920  
1PEA/US 30 JAN 2001

Attorney Docket: 213/219-PCT2

25. The mixing apparatus of claim 22 wherein the outwardly extending beams extend radially from a hub.
26. The mixing apparatus of claim 22 in which the swirl chamber is disposed to receive a material from a plurality of openings, each of which is fitted with a member that at least partially directs the material in a swirling motion.
27. The mixing apparatus of claim 22 in which the swirl chamber is disposed to receive a material from a plurality of openings, each of which is fitted with a ramp sloping downward in a direction of flow into the swirl chamber.
28. The mixing apparatus of claim 22 wherein the distribution tray is fitted with a plurality of bubble caps having riser vanes spaced apart from each other to define a plurality of vane passageways.
29. The mixing apparatus of claim 22 in which the swirl chamber has a wall that includes a plurality of openings that receive and impart to the material a swirling force, and a ramp sloping downward in a direction of flow into the swirl chamber.
30. The mixing apparatus of claim 29 in which the wall is fitted with a plurality of wall baffles, and further comprising a collection tray having a plurality of floor baffles fluidly communicating with, and upstream of the plurality of openings.



## PATENT COOPERATION TREATY

PCT

NOTIFICATION OF THE RECORDING  
OF A CHANGE(PCT Rule 92bis.1 and  
Administrative Instructions, Section 422)

From the INTERNATIONAL BUREAU

To:

FISH, Robert, D.  
Fish & Associates, LLP  
Suite 706  
1440 N. Harbor Boulevard  
Fullerton, CA 92835  
ETATS-UNIS D'AMERIQUE

Date of mailing (day/month/year) 18 December 2000 (18.12.00)	<b>IMPORTANT NOTIFICATION</b>
Applicant's or agent's file reference 213/219-PCT2	
International application No. PCT/US99/24920	International filing date (day/month/year) 21 October 1999 (21.10.99)

1. The following indications appeared on record concerning: <input type="checkbox"/> the applicant <input type="checkbox"/> the inventor <input checked="" type="checkbox"/> the agent <input type="checkbox"/> the common representative		
Name and Address FISH, Robert, D. Crockett & Fish 1440 N. Harbor Boulevard Fullerton, CA 92835 United States of America	State of Nationality	State of Residence
	Telephone No. 714 449 2337	
	Facsimile No. 714 449 2339	
	Teleprinter No.	
2. The International Bureau hereby notifies the applicant that the following change has been recorded concerning: <input type="checkbox"/> the person <input checked="" type="checkbox"/> the name <input checked="" type="checkbox"/> the address <input type="checkbox"/> the nationality <input type="checkbox"/> the residence		
Name and Address FISH, Robert, D. Fish & Associates, LLP Suite 706 1440 N. Harbor Boulevard Fullerton, CA 92835 United States of America	State of Nationality	State of Residence
	Telephone No. 714 449 2337	
	Facsimile No. 714 449 2339	
	Teleprinter No.	
3. Further observations, if necessary: <b>The indication of a new agent's name on the demand (Form PCT/IPEA/401) has been considered a request for recording a change under Rule 92bis. In case of disagreement, the International Bureau should be notified immediately.</b>		
4. A copy of this notification has been sent to: <input checked="" type="checkbox"/> the receiving Office <input type="checkbox"/> the designated Offices concerned <input type="checkbox"/> the International Searching Authority <input checked="" type="checkbox"/> the elected Offices concerned <input checked="" type="checkbox"/> the International Preliminary Examining Authority <input type="checkbox"/> other:		

<b>The International Bureau of WIPO</b> 34, chemin des Colombettes 1211 Geneva 20, Switzerland Facsimile No.: (41-22) 740.14.35	Authorized officer <b>F. Baechler</b> Telephone No.: (41-22) 338.83.38
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